Kit 174. RF Data Link – Serial Receiver - DRAFT

This kit is one in a series of four kits that implement an RF data link. The kits in the series are:

1. K173 – Serial Input transmitter
2. K174 - Serial Output receiver
3. K175 - Parallel Input transmitter
4. K176 - Parallel Output receiver

Each receiver has a 4-bit address set by an onboard 4-way DIP switch. This allows a total of 16 receivers to be used in a 'network' with each one being uniquely addressable.

The RF modules operate at 433.92MHz and use "amplitude modulation" to transmit data. This transmission method, also known as 'On-Off Keying (OOK)', transmits data by simply switching the carrier signal on and off. They are produced by 'WenShing' of Taiwan – datasheets can be downloaded from their website at "www.wenshing.com.tw".

Each kit contains an Atmel 89C2051 microcontroller that handles all I/O as well as encoding and decoding the data.

OVERVIEW
K174 will receive any messages sent by K173 or K175 and output the data via its serial port. The data format is fixed at **8N1** (8 data bits, no parity, 1 stop bit). The data rate is selectable between 2400 and 9600 baud. An optional carriage return/line feed can be appended to the output.

TECHNICAL MANUAL
A PDF document detailing the technical features and operating guidelines of this and the other 3 kits is available for download from:

"www.kitsrus.com/pdf/rfdatalinktechmanual.pdf".

You will need to download and read this document to be able to use all the features and options of these kits in your own application.

QUICK START – HOW TO USE THIS KIT
We will now show you how easy it is to use these kits. We will combine K145 (Temperature Logger kit) with K173 and K174 to create a remote wireless connection to a PC.

K145 can monitor up to 4 x DS1820 temperature sensors. The kit automatically detects how many sensors are connected and outputs the reading from each sensor to the serial port. It is powered from the serial port as well.

When connected to a PC each sensor's readings can be displayed on the screen using a simple terminal program such as Hyperterminal (which comes with Windows). You can download a PDF on how to set up Hyperterminal from "www.kitsrus.com/pdf/hyperterminal.pdf". When using with K145 set the baud rate to 2400 - everthing else is the same.

Normally K145 is connected to the PC using a serial cable. This limits the distance of the kit from the PC to around 30m (100ft). Using K173 and K174 we can extend that distance to around 100m (300ft) and it's all done without wires!

Before using K173 and K174, let's make sure the 'normal' connection is working. Connect K145 to the PC's serial port and run Hyperterminal. If the kit is working normally and Hyperterminal is set up correctly the temperature readings should be displayed on the screen. If so we can now replace the 'wired' connection with the K173/K174 combination.

First, set the DIP switches and jumpers on K173 and K174 as follows:

K173		K174	
SW1:1	OFF	SW1:1	ON
SW1:2	ON	SW1:4	OFF
SW1:3	ON	SW1:3	OFF
SW1:4	OFF	SW1:4	OFF
SW1:5	ON		
SW1:6	OFF	J1	OFF
SW1:7	OFF	J2	ON
SW1:8	OFF	J3	ON
J1	ON		

Disconnect K145 from the PC and connect it to K173. Connect K174 to the PC's serial port. You will need to power both K173 and K174 with a suitable DC supply - 12VDC is just fine.

You should see the temperature data on the screen just as before except now it is coming in via the wireless connection! You can experiment with the range by simply picking up the K145/K173 combination and moving it away from the PC.

DIP SWITCH and JUMPER SETTINGS
A number of operating features are set by the 4-way DIP switch SW1 and jumpers J1, J2 and J3. Full details available in the technical manual.

SW1:1 - SW1:4 Receiver address
Sets the address of the receiver. The address is 4-bits wide meaning that up to 16 receivers can be used together, each with their own unique address. The kit will respond to any messages containing a matching address.

Note: It is possible for a message to contain **no** address. This is known as a 'broadcast' message and all receivers will respond to it. For details refer to the 'RF Data Link Protocol' document mentioned previously.

J1   Receiver address disable
If this jumper is ON then the kit will respond to ALL messages received, regardless of whether they contain an address or not.

This feature is useful when debugging or monitoring activity in a working system. Connect to a PC and run a terminal program and all received messages will be displayed on the screen. You can then see what messages are being sent and what data they contain.

J2   CR/LF enable

If ON then a carriage return/line feed is sent after each message. Useful if displaying messages on a screen because each message will start on a new line. Also necessary if the messages are being captured by a program or onto disk - a carriage return is often required to terminate the message.

Kit 174. RF Data Link – Serial Receiver - DRAFT

J3   Baudrate select

Sets the serial port baudrate - ON = 2400, OFF = 9600. This jumper is only checked at power up so the kit should be powered down before changing the baudrate.
Serial data format: 8N1 (8 data bits, no parity, 1 stop bit)

LED L2

The LED L2 lights while the kit is outputting the received message to the serial port.

KIT ASSEMBLY

It is recommended that components be inserted and soldered in the following order, using the component overlay on the PCB as a guide.

1. All the resistors and diodes. Make sure diodes are right way around.
2. IC sockets
3. Capacitors C7,8,9,10. Note that C9 fits inside the 20-pin IC socket so push it all the way down.
4. 5V regulator IC3 and jumpers J1,2,3
5. LEDs. The flat spot on the body lines up with the 'line' on the component overlay
6. DIP switch
7. Electrolytic capacitors C1,2,3,4,5,6. These are polarized – the negative lead is indicated on the capacitor but the PCB indicates the '+' lead.
8. Ceramic resonator Y1
9. D9 connector and DC jack
10. RF receiver module

A length of wire is supplied for the antenna. This needs to be trimmed to a length of **17.3cm** (1/4 wavelength). Strip one end and solder into the ANT hole on the PCB.

Before inserting any ICs in their sockets we need to check the 5V supply. Power up the kit using a suitable DC power supply eg. 12V and measure the voltage on pins 10 and 20 of the IC1 socket (positive on pin 20). Should be approximately 5 volts.

If OK then remove power and insert the ICs.

TROUBLESHOOTING

Most faults are due to assembly or soldering errors. Verify that you have the right components in the right place.
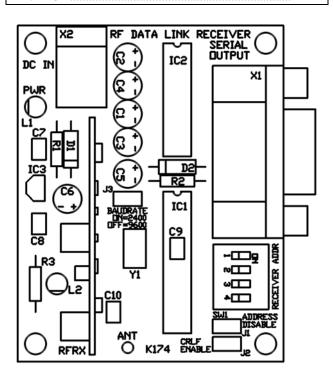
Inspect your work carefully under a bright light. The solder joints should have a 'shiny' look about them. Check that there are no solder bridges between adjacent pads.

Check that no IC pins are bent up under the body of the IC. This can sometimes happen when inserting ICs into sockets.
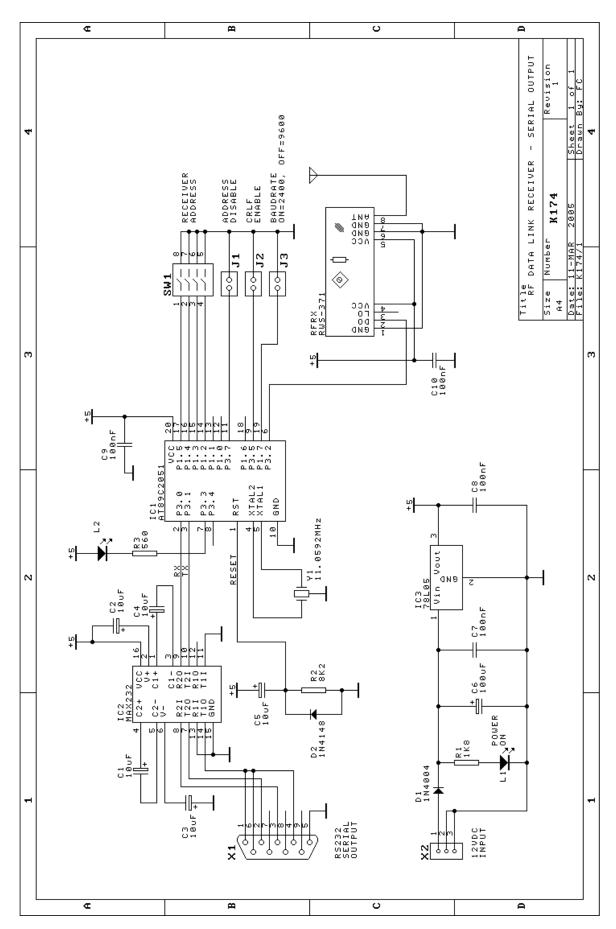
CONTACT DETAILS

Full range of kits on our website at http://www.kitsrus.com.
Kit developer - frank2005@ozitronics.com.

PARTS LIST – K174

Resistors (0.25W carbon film unless specified)

560R	R3	1
1K8	R1	1
8K2	R2	1

Capacitors

100nF mono, 0.1"	C7,8,9,10	4
10uF 16V electrolytic	C1,2,3,4,5	5
100uF 25V electrolytic	C6	1

Semiconductors

1N4004	D1	1
1N4148	D2	1
LED, red, 3mm	L1,2	2
AT89C2051 micro (programmed)	IC1	1
MAX232	IC2	1
78L05, 5V regulator	IC3	1

Miscellaneous

Ceramic resonator, 3 pin 11.0592MHz	Y1	1
DIP switch, 4 way	SW1	1
Header & shunt, 2 pin	J1,2,3	3
D9 connector, female right angle, PCB mtg	X1	1
DC jack, 2.5mm	X2	1
RF receiver module 433.92MHz, 'Wenshing' RWS-371-6	RFRX	1
IC socket, 20 pin, for IC1		1
IC socket, 16 pin, for IC2		1
Hookup wire for antenna, 20cm		1
K174 PCB		1

Kit 174. RF Data Link – Serial Receiver

Title: RF DATA LINK RECEIVER - SERIAL OUTPUT
Size: A4 Number: K174 Revision: 1
Date: 11-MAR 2005 Sheet: 1 of 1
File: K174/1 Drawn By: FC